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## CONTEXTUALLY ORGANIZING NOTES IN AN ASSISTANT ENVIRONMENT

### ABSTRACT

An assistant is described that stores and organizes user created information (e.g., memos, notes, lists, reminders, etc.) such that the assistant can easily retrieve the information during a future interaction between the user and the assistant. The assistant supplements or tags information with contextual data or other descriptors that are relevant to the real-world or virtual situation the user was in, when the information was originally created or last modified by the assistant. This way, the assistant can later retrieve the information if the user makes references to the specific the information or the previous situation that the user was in when interacting with the assistant when the information was created or last modified.

### DESCRIPTION

Virtual, intelligent, or computational assistants (e.g., also referred to simply “assistants”) execute on counter-top devices, mobile phones, automobiles, and many other type of computing devices. Assistants output useful information, responds to users’ needs, or otherwise performs certain operations to help users complete real-world and/or virtual tasks. Some assistants are configured to record reminders, notes, lists, and other information as persistent records that a user can later retrieve or modify during a subsequent interaction with the assistant. While providing a user interface for creating a persistent record may be somewhat trivial, organizing and maintaining persistent records for quick and easy subsequent retrieval may be challenging for some assistants.

In many cases, a user may wish to reference information maintained by the assistant but may not always know the best way to direct the assistant to the particular information to which

the user is referring. For example, a user may interact with an assistant while lounging in the living room at home to create a shopping list. The assistant may tag the shopping list with a date, time, location, and other contextual information about the environment that the user was in while creating the shopping list. The next day, when the user is at work the user may think of some more items to add to the shopping list and tell the assistant to add the additional items to the shopping list. However, because the assistant maintains multiple shopping lists for the user, the user's instruction referencing a "shopping list" may be ambiguous. But because the user is unaware of how the assistant organizes or maintains the multiple shopping lists, the user may not know an easy way of directing the assistant to the correct list.

The example system shown in FIG. 1 provides an assistant architecture that automatically tags user created information with supplemental data to facilitate quick and easy retrieval of the information during future interactions between an assistant and a user. The assistant of FIG. 1 tags information it stores with simple memory triggers that users will want to use when explaining to the assistant what information the user wants the assistant to recall.

For example, if instead of telling the assistant to modify "the shopping list" the user tells the assistant to "modify the shopping list we created the night before in the living room" the assistant, while using the signal "the night before in the living room", can search the information it maintains for the user to find any information, or specifically any lists it maintains, that are tagged with a date or time that satisfies "the night before" and/or that are tagged with a location that matches the user's "living room". That is, the assistant matches supplemental signals it receives from user interactions (or requests additional clarifying information from the user) to the information tags to identify the information that the user is likely referencing.

Further to the descriptions below, a user may be provided with controls allowing the user to make an election as to both if and when the assistant, the computing device, or the computing

systems described herein can collect or make use of user information (e.g., user information or contextual information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), and if and when the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over what user information is collected about the user, how that user information is used, and what user information is provided to the user.

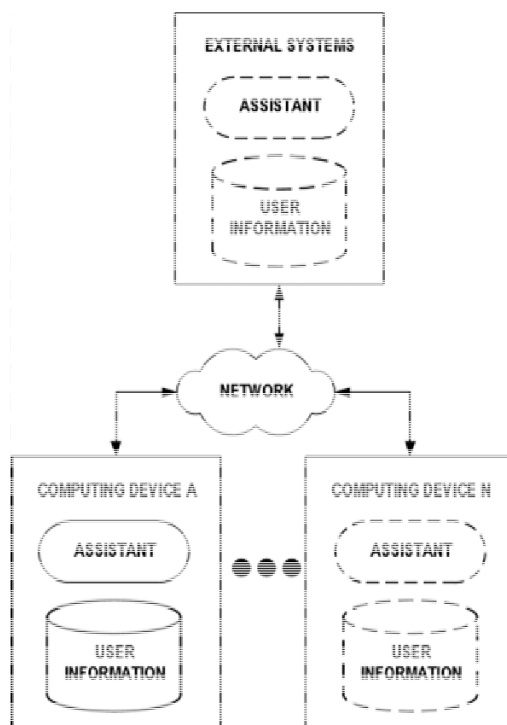


FIG. 1

The system of FIG. 1 includes one or more external systems and computing devices A–N communicating across a network to provide an assistant service that maintains user information.

The network of FIG. 1 represents a combination of any one or more public or private

communication networks, for instance, television broadcast networks, cable or satellite networks, cellular networks, Wi-Fi networks, broadband networks, and/or other type of network for transmitting data (e.g., telecommunications and/or media data) between various computing devices, systems, and other communications and media equipment.

Computing devices A–N represent any type of computing device that is configured to execute an assistant and communicate on a network. The external systems represent any type of server or other computing system that is configured to support the assistants executing at computing devices A–N.

The external systems and computing devices A–N can be personal, corporate, or government owned computing devices. In some examples, computing devices A–N may be shared assets of multiple users. Examples of computing devices A–N include servers, mainframes, cloud computing environments, mobile phones, tablet computers, wearable computing devices, countertop computing devices, home automation computing devices, laptop computers, desktop computers, televisions, stereos, automobiles, and any and all other type of mobile and non-mobile computing device that is configured to execute an assistant. For example, computing device A may be a countertop assistant device and computing device N may be a mobile phone or automobile infotainment system.

An Assistant executes across the external systems and one or more of computing devices A–N to provide assistant services to users of computing devices A–N. Examples of assistant services include: setting up reminders, creating calendar entries, booking travel, online ordering, sending messages or other communications, controlling televisions, lights, thermostats, appliances, or other computing devices, providing navigational instructions, or any other conceivable task or operation that may be performed by an assistant.

As a user interacts with the assistant, the assistant may obtain personal information about the user. Examples of personal information include: habits, preferences, notes, lists, contacts, communications, interests, location histories, and other types of user information. After receiving explicit permission from the user, the assistant may store the personal information at user information data stores and in the course of providing assistant services, make use of the personal information stored at the user information data stores.

The external systems, computing devices A–N, and the assistant treat the information stored at the information stores so that the information is protected, encrypted, or otherwise not susceptible to hacking or unauthorized use. The information stored at the information data stores may be stored locally at each of computing devices A–N and/or remotely (e.g., in a cloud computing environment provided by the external systems and which is accessible via the network of FIG. 1).

When a user is interacting with the assistant, the assistant may define a context of the user. The context is indicative the state of the user, the user's environment, and/or the operating environment of the one or more computing devices A–N that the user is interacting with at a particular time. The context might indicate a location of the user, a time of day, weather conditions, traffic conditions, an activity performed by the user, other people in the presence of the user, or any other information that could later be used by a user to trigger the assistant's recollection of a voice note, memo, or other user created information being stored at the information data stores.

The assistant may annotate or tag information stored at the information data stores with supplemental data derived from the context defined at the time that the information was stored or modified. The annotations enable the assistant to quickly and easily parse through the information to identify information according to its annotations. For example, if the assistant

receives a user request for information that the user told the assistant on a particular day and/or when the user was performing a particular activity, the assistant can query the information data stores for information that is tagged with metadata indicative of the particular day and/or particular activity. The annotations or tags are therefore used by the assistant as memory triggers which allow a user to instruct the assistant what information the user wants recalled, without necessarily providing a lot of details about the information. For example, consider the following use cases.

As a first example, computing device A may be a mobile phone. A user of computing device A may interact with the assistant via computing device A while at work and may ask the assistant to remind her that she needs to fill out her child's school registration paperwork that is coming due next week. The assistant may create a reminder on the user's calendar that is set to alert the user day before the paperwork is due. In addition to setting the reminder, the assistant may tag the reminder with metadata indicative of a context of the user when the user told the assistant to create the reminder. The reminder may be tagged with the time of day, the location (e.g., work location), and other information so that the user can later recall the reminder without necessarily specifying all the details of the reminder.

Later that night, while at home, the user may interact with computing device N which may be a counter top computing device. The user may ask the assistant "what did I tell you earlier that I was supposed to remember to do"? The assistant may search the information data stores for reminders and may narrow the search by querying specifically for reminders that were created earlier that day. The assistant may retrieve the reminder for the user to complete the paperwork and output a message (e.g., a voice-message via a speaker of computing device N) "you wanted to remember to fill out Daniel's school registration paperwork that is due next Friday."

As a second example, while the user is at home watching a movie being played by computing device N, the user may interact with the assistant to tell the assistant to add microwave popcorn to a list. The assistant may create, at the information data stores, a list that includes microwave popcorn. The assistant may tag the list with metadata indicative of a context of the user when the user told the assistant to create the list and/or other information that the user can use to later recall the list. For example, the assistant may tag the list that includes popcorn with information about the movie she was watching, the location where the list was created, the word shopping, etc. Also, while the user is watching the movie, the user may interact with the assistant to tell the assistant to add the movie she is watching to list of favorite movies.

Later that night, the user may interact with the assistant to tell the assistant to add a special sized lightbulb for a light fixture to the list she started while watching the movie. The assistant may query the information data stores for all the lists being stored at computing device N and narrow the search to lists that were started or first created at the time she was watching the movie. The assistant may not identify the list of favorite movies because the list of favorite movies was created before the user started watching the movie she was watching that night. Instead, the assistant may identify the list with the popcorn based on metadata tagged to the list that indicates the popcorn list was the list started during the movie. The assistant may add the lightbulb to the list with popcorn as oppose to the list of favorite movies.

As another example, while the user is in her car and interacting with computing device A, which in this example is the car's infotainment system, the user may be listening to a guest on a radio show make reference to her favorite vacation destination as being Bora Bora. The user may ask the assistant to remember Bora Bora for her so she should look up travel costs, etc. later when she isn't driving. The assistant may store, at the information data stores, a note that



includes Bora Bora and tag the note with information indicating that the user was driving, where and when she was driving, and other contextual information.

While at work, the user may interact with computing device N which may, in this example, be a work computer. The user may interact with the assistant and ask the assistant to recall that place she asked the assistant to remember while driving in to work. The assistant may query the information data stores for notes that are tagged with contextual information indicative of the time the user was driving that day, or tagged with an activity of driving or commuting. The assistant may identify the note created that included the place “Bora Bora” and output Bora Bora to the user so the user could use that information (e.g., to search for more information, tell a coworker, etc.).

By tagging or otherwise supplementing the information it stores on behalf of the user, the assistant makes retrieving the information easier both for the assistant and the user. Users may use colloquial language, including common memory triggers, to cause assistants to recall and retrieve the particular information for which the users are looking. The above examples are just some use cases for the assistant architecture shown in FIG. 1, the assistant architecture has many other applications and use cases.